

# Childhood drowning in Manitoba: A 10-year review of provincial Paediatric Death Review Committee data

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**BACKGROUND:** Drowning is the second leading cause of unintentional injury death for Canadian children up to 19 years of age. Specific regional drowning prevention strategies require a detailed understanding of patterns of injury, including risk factors. Paediatric death review committees have the opportunity to identify these risk factors, and to identify and advocate prevention strategies.

**OBJECTIVES:** The purpose of the present study was to analyze Manitoba Paediatric Death Review Committee (PDRC) drowning data to identify drowning risk factors and potential prevention strategies.

**METHODS:** A 10-year (1988-1997) review of the College of Physicians and Surgeons of Manitoba PDRC database was performed. Drowning deaths were summarized in terms of demographic variables and lack of supervision at the time of the drowning events.

**RESULTS:** Seventy-three drowning deaths were reviewed by the PDRC during the study period. These children ranged from 29 days to 14 years of age. They included 50 boys and 30 First Nations children. The highest mortality rates were found in First Nations children (12.4/100,000 First Nations children compared with 1.9/100,000 non-First Nations children), boys (3.9/100,000 boys compared with 1.9/100,000 girls) and toddlers aged one to four years (5.9/100,000 children).

**CONCLUSIONS:** Priority populations for drowning prevention in Manitoba include First Nations children, boys and toddlers. Death review committees can contribute to childhood injury prevention by reviewing injury deaths, analyzing and reporting injury mortality data, and identifying and advocating prevention strategies.

**Key Words:** Children; Drowning; First Nations; Injury prevention; Manitoba; Mortality review

*Résumé à la page suivante*

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## Les noyades d'enfants au Manitoba : Une étude des données du *Paediatric Death Review Committee* provincial, sur dix ans

**HISTORIQUE :** La noyade est la deuxième cause principale de décès par blessure non intentionnelle chez les enfants canadiens de 19 ans et moins. Pour établir des stratégies régionales précises de prévention de la noyade, il faut posséder une compréhension détaillée des modèles de blessure, y compris les facteurs de risque. Les comités d'étude des décès en pédiatrie ont l'occasion de repérer ces facteurs de risque et de trouver et promouvoir des stratégies de prévention.

**OBJECTIFS :** La présente étude visait à analyser les données du *Paediatric Death Review Committee* (PDRC) du Manitoba au sujet de la noyade afin de repérer les facteurs de risque de noyade et les stratégies de prévention potentielles.

**MÉTHODOLOGIE :** Une étude de la base de données du PDRC du collège des médecins et chirurgiens du Manitoba a été exécutée sur une période de dix ans (1988-1997). Les décès par noyade ont été résumés

compte tenu de leurs variables démographiques et de l'absence de supervision au moment de l'incident.

**RÉSULTATS :** Soixante-treize décès par noyade ont été examinés par le PDRC pendant la période de l'étude. Ces enfants étaient âgés de 29 jours à 14 ans et incluaient 50 garçons et 30 enfants des Premières Nations. Le taux de mortalité le plus élevé s'observait chez les enfants des Premières Nations (12,4 cas d'enfants des Premières Nations pour 100 000 enfants par rapport à 1,9 cas d'enfants ne provenant pas des Premières Nations pour 100 000 enfants), chez les garçons (3,9 cas de garçons pour 100 000 enfants par rapport à 1,9 cas de filles pour 100 000 enfants) et chez les tout-petits de un à quatre ans (5,9 cas de tout-petits pour 100 000 enfants).

**CONCLUSIONS :** Les populations prioritaires dans lesquelles promouvoir la prévention de la noyade au Manitoba sont les enfants des Premières Nations, les garçons et les tout-petits. Les comités d'étude des décès peuvent contribuer à la prévention des blessures pendant l'enfance en examinant les décès secondaires à des blessures, en analysant et en rendant compte des données relatives aux mortalités par suite de blessures, de même qu'en repérant et en faisant la promotion des stratégies de prévention.

Of the three leading causes of paediatric unintentional injury deaths, drowning ranks second or third in most countries (1). For Canadian children 0 to 19 years of age, drowning is the second leading cause and accounts for 11% of such deaths (2). Boys are more likely to drown than girls (2.6 versus 0.8 per 100,000 population), and mortality and hospitalization rates are highest among toddlers aged one to four years. Manitoba has the highest drowning rate in Canada (3.1 versus 1.7, per 100,000 population, respectively), followed by British Columbia (2.4 per 100,000 population) (2).

The College of Physicians and Surgeons of Manitoba began monitoring paediatric deaths for Manitoba (population 1.1 million) in 1976. The principle purpose of the Paediatric Death Review Committee (PDRC) is to review standards of medical care for Manitoba children between the ages of 29 days and 14 years. In particular, the Committee reviews all deaths that occur among these children within Manitoba. The PDRC identifies deaths based on information received from Vital Statistics, the medical examiner and hospital standards committees. Cases are then analyzed by using medical records that include physician and hospital charts, and autopsy reports. The Committee's medical consultant reviews each case in detail. All Committee members subsequently review the case and determine whether the death was preventable. Where relevant and appropriate, the PDRC then recommends action to correct deficiencies in medical care. The Committee also may offer recommendations pertaining to 'systems' deficiencies relating to health care, social services, justice or education. Recent injury prevention-related actions arising from mortality reviews include advocating bicycle helmet legislation and improved car seat education, legislation and enforcement.

The purpose of the present study was to analyze Manitoba PDRC drowning data to identify risk factors for childhood drowning and potential prevention strategies.

## METHODS

We reviewed the drowning deaths of Manitoba children that were reported to the PDRC and occurred between January 1, 1988 and December 31, 1997. These children were between 29 days and 14 years of age. The data were obtained from the PDRC annual reports, and the PDRC used a Microsoft Access (Microsoft Inc, USA) database for further analysis of the data. The following variables were examined: age, sex, First Nations status (as reported to Manitoba Health), season and lack of supervision. Other circumstances of injury (type of body of water, specific activity, presence of pool safety structures, etc) were unable to be examined because such variables were added to the database in 1990. Overall paediatric population data were obtained from Manitoba Health. Finally, a descriptive analysis of the data was completed, and mortality rates for variables of interest were calculated. Because only aggregate and anonymous data were used for the project, patient confidentiality was ensured.

## RESULTS

Between January 1, 1988 and December 31, 1997 there were 73 drowning deaths of children reported to the PDRC. The drowning mortality rate was 2.9 per 100,000 children (29 days to 14 years of age) per year for the 10-year study period. In summary, there are four notable trends (Table 1, Figure 1): drowning rates in the Manitoba paediatric population peak in the summer months (June, July and August), in First Nations children, boys and children one to four years of age. First Nations children experienced the highest drowning mortality rates: 12.4 per 100,000 First Nations children compared with 1.9 per 100,000 non-First Nations children. Thirty-three children had been left alone (ie, unsupervised) at the time of the incident.

## DISCUSSION

These injury patterns in Manitoba children are similar to those reported for other Canadian children (2). Boys of all

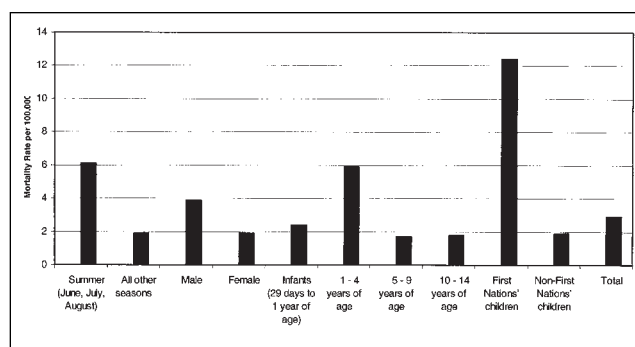
**TABLE 1**  
**Patterns of childhood drowning in Manitoba (1988 to 1997)**

|                               | Deaths<br>(n) | Annual mortality rate<br>(per 100,000 children) |
|-------------------------------|---------------|---|
| Season                        |               |   |
| Summer (June, July, August)   | 38            | 6.1   |
| All other seasons             | 35            | 1.9   |
| Sex                           |               |   |
| Boy                           | 50            | 3.9   |
| Girl                          | 23            | 1.9   |
| Age range                     |               |   |
| Infants (29 days to one year) | 4             | 2.4   |
| One to four years             | 40            | 5.9   |
| Five to nine years            | 14            | 1.7   |
| 10 to 14 years                | 15            | 1.8   |
| First Nations status          |               |   |
| First Nations children        | 30            | 12.4  |
| Non-First Nations children    | 43            | 1.9   |
| <b>Total</b>                  | <b>73</b>     | <b>2.9</b>                                      |

ages have an increased risk of drowning. Toddlers typically experience the highest rates of drowning deaths as well as near-drowning hospitalizations (2). First Nations children have been shown to have a two- to ninefold increased risk of drowning (2). Additional risk factors for drowning identified in the literature include epilepsy (3-5), autism (6) and other conditions characterized by developmental delay and/or reduced mobility (7). Two of these risk groups – First Nations children and toddlers – warrant consideration of targeted strategies.

The markedly elevated drowning risk for First Nations children may be due to a wide variety of factors. Living in remote communities surrounded by water, necessitating transport by water during warm weather and over ice in winter, increases the exposure of children to boating, and travelling by snowmobile and all-terrain vehicle. Children and youth in these communities live, play and work near water. Access to safety equipment such as personal flotation devices (PFDs) is limited, and the cost to purchase equipment for all family members is prohibitive. Rough terrain, distance and lack of resources hamper rescue, first aid and medical care. Supervision and physical barriers at the waterfront could provide additional protection for children at play. For transport by boat, snowmobile and all-terrain vehicle, training of operators and use of PFDs (including on ice in spring and fall) are possible preventive measures. Innovative strategies such as PFD incentives, subsidies or loan programs are needed for these communities.

Toddlers are at risk for drowning in and around the home, including residential pools. Prevention programs have emphasized parental supervision; however, engineering and legislative strategies should not be overlooked.



**Figure 1)** Drowning mortality rates in Manitoba from 1988 to 1997

Toilet lid locks and simple bathroom door locks prevent access to the toilet and bathtub. Municipalities should enforce legislation ensuring that residential pools have four-sided fencing separating the pool from the home, with self-closing and self-latching gates. Drainage ditches, septic fields and other standing bodies of water in the community should have permanent barriers erected around them. Spring and fall pose additional risks, with thin ice and fast moving water. Seasonal warnings issued through the media and dramatic municipal signage at high-risk access points may remind parents of these hazards to toddlers. Adequate fencing of yards with locking gates can further reduce the exposure of toddlers to local bodies of water.

Drowning prevention for these and other populations at risk may include office counselling for patients and their families. Many physicians acknowledge and support the role of anticipatory guidance and paediatric injury prevention counselling. However, a number of barriers to counselling have been identified. O'Flaherty and Pirie (8) randomly surveyed American paediatricians who were on the membership list of the American Academy of Pediatrics. They assessed paediatricians' awareness of the epidemiology of childhood drowning, their opinions and current practices regarding its prevention, and their desire to assume more responsibility for its prevention. The study revealed that only a minority of respondents provided written material and/or anticipatory guidance regarding drowning prevention to their patients and caregivers. This study also demonstrated that physicians who received formal education on drowning prevention in their residency training were more likely to include drowning prevention counselling in their clinical practices. Barkin and Gelberg (9) similarly surveyed Los Angeles County paediatricians, family physicians and paediatric nurse practitioners. These authors found that approximately only one of three clinicians counselled on drowning prevention.

Potential barriers to drowning prevention counselling include (10) reduced physician flexibility and autonomy to provide such services due to limitations imposed by other members of the health care system (patients, government, administrators, etc); the emphasis and pressure of the current health care system (including medical training for

**TABLE 2**  
**Childhood drowning prevention counselling**

| Risk group/environment | Prevention strategies   |
|------------------------|---|
| Infants and toddlers   | Supervise at arm's length near any body of water (toilets, bathtubs, water-filled buckets, etc)<br>Eliminate water hazards around the home (eg, water-filled buckets, ponds, wells)   |
| Adolescents            | Do not use drugs or alcohol while boating, swimming, diving, etc<br>Wear a personal floatation device (PFD)<br>Use caution when riding all-terrain vehicles or snowmobiles on ice<br>Note that, by law, children less than 16 years of age cannot operate personal watercraft and must comply with new-age horsepower limits ( <a href="http://www.ccg-gcc.gc.ca">www.ccg-gcc.gc.ca</a> ) |
| First Nations children | Supervise play near water. Erect barriers near play areas<br>Use PFDs when travelling over water or ice (spring and fall)<br>Train boat, snowmobile, and all-terrain vehicle operators to evaluate and manage water-related dangers   |
| Children with epilepsy | Supervise while swimming and bathing<br>Shower is the safest method of bathing  |
| Swimming               | Note that swimming lessons for children younger than four years of age do not prevent drowning<br>After four years of age, encourage formal swimming lessons  |
| Pool safety            | Install four-sided fencing with a self-closing, self-latching gate<br>Remove toys and furniture from pool and near pool fencing<br>Learn cardiopulmonary resuscitation. Have telephone and rescue equipment at poolside   |
| Boating                | Review the new federal boating regulations ( <a href="http://www.ccg-gcc.gc.ca">www.ccg-gcc.gc.ca</a> )<br>Wear a PFD<br>Do not use alcohol or drugs<br>Bring required safety equipment onboard<br>Get trained – required by law for operators younger than 20 years of age and boats less than 4 m   |

physicians) to preferentially respond to acute and/or immediate patient complaints; patient expectations that physicians will focus primarily on the problem for which they seek help; the belief of some physicians that prevention counselling can easily be done by another member of the health care team; and inadequate resources to provide these services.

One efficient way to encourage counselling is to include drowning prevention topics (along with other injury-related topics) in the curricula of educational institutions, such as residency training programs, particularly for family medicine and paediatrics. Physicians can also initiate and/or partake in community efforts aimed at developing and ensuring adequate drowning surveillance systems and public education programs. Additionally, physicians can advocate legislative changes, enforcement of existing regulations and various technological or engineering interventions. Finally, physicians need to remain abreast of the research literature that addresses pertinent topics related to injuries and injury prevention counselling.

The following recommendations for counselling summarize what is known about effective drowning prevention strategies (1,8-17).

#### Prevention tips for special populations

- **Infants and toddlers:** Provide constant supervision for young children around any body of water including toilets, bathtubs and water-filled buckets.
- **Infants and toddlers:** Eliminate water hazards in and around the home. This includes emptying water-

filled buckets after use. Submersion injuries in buckets are more likely in children between eight months and three years of age.

- **Adolescents:** Counsel adolescents about the dangers of alcohol and other drug consumption during aquatic recreation activities. Encourage them also to wear PFDs. Caution adolescents about using motorized vehicles, such as all-terrain vehicles and snowmobiles, on ice that may be incompletely frozen (early winter and spring). Check the new boating regulations regarding age limits and operator competency requirements for personal watercraft and motor boats ([www.ccg-gcc.gc.ca](http://www.ccg-gcc.gc.ca)).
- **First Nations children:** Supervise play near water. Erect barriers near play areas. Use PFDs when travelling over water or ice (spring and fall). Train boat, snowmobile, and all-terrain vehicle operators to evaluate and manage water-related dangers.
- **Children with epilepsy:** Always supervise children with epilepsy when they swim or bathe. Showering is the safest method for bathing.

#### Prevention tips for swimming and other water-based recreational activities

- Remember that swimming lessons for children younger than four years of age do not decrease the risk of drowning (12). Early 'swim programs' for

infants and toddlers may give parents a false sense of security. After approximately four years of age, encourage formal swimming and water safety lessons.

- Emphasize the importance of proper fencing. Installation of four-sided fencing that isolates the pool from the house and the yard has been shown to decrease the number of pool immersion injuries by more than 50% (11). Fences need to be at least 1.5 m (5 feet) high with openings between vertical slats and/or bars less than 100 mm (4 inches) wide. Pool gates must be self-latching and self-closing, and should open away from the pool.
- Recognize that pool and door alarms, and pool covers are not a substitute for four-sided fencing. Solar pool blankets are not recommended because they can delay rescue and appear to young children to provide a solid surface for crawling or walking.
- To avoid attracting young children to water, remove all toys from the poolside and pool when not in use. Move patio furniture, ladders and play equipment away from pool fences to prevent a child from climbing over the fence.
- Keep pools completely filled (or emptied) to make it easier for a submersion victim to grab the pool edge for escape.
- Instruct children to swim and play away from suction drains to avoid entanglement of long hair, clothing or extremities.
- Make certain that all caregivers learn cardiopul-

monary resuscitation and have safety items at the poolside (telephone, approved PFD, etc).

- Always determine water depth and hazards before allowing children to jump or dive into any body of water.
- Encourage children to use a government-approved PFD when on boats, in water or even when playing near water.
- Encourage parents to instruct all caregivers of the child regarding water safety.

Successful prevention of childhood drowning involves the dedication of physicians, caregivers, government and nongovernment stakeholders, and the public. A committee such as the PDRC can play a key role as a new partner for prevention. Such a committee can contribute to childhood injury prevention by reviewing injury deaths, analyzing and reporting injury mortality data, and identifying and advocating prevention strategies. Future related studies can further detail and analyze specific circumstances of drowning deaths. Such drowning death parameters could include type of body of water (natural, frozen natural, public pool, residential pool, bathtub, bucket, etc); specific activity (swimming, boating, bathing, accidental fall, etc); and presence of pool safety structures (appropriate fences and gates, life-saving equipment, etc). Such an analysis would help to further refine and target the drowning prevention efforts.

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